Flammability Evaluation

R134a, HFO1234yf and CO2

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Hyundai·Kia America Technical Center, Inc.

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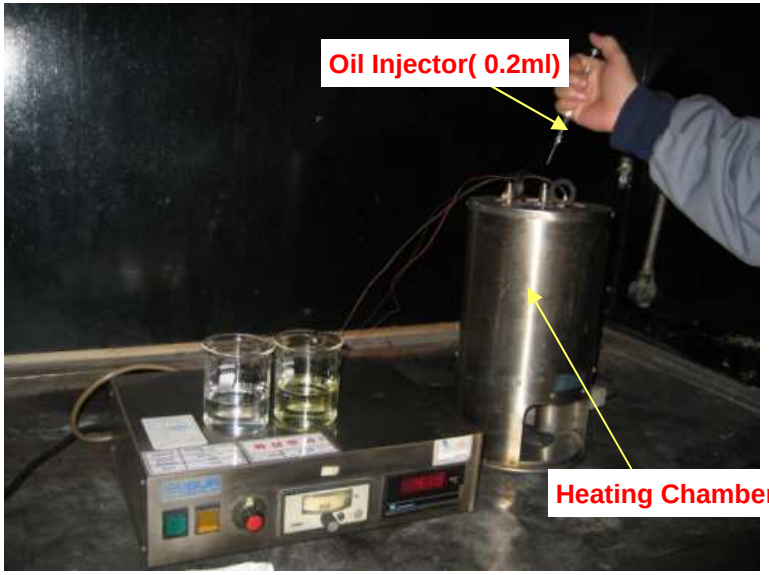
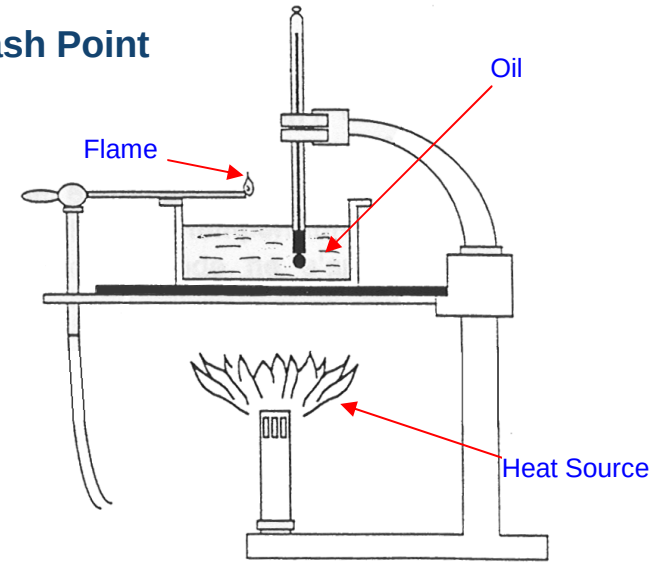
1. Ignition Tests for PAG oils



Oil Type / Ignition	ISUPAG 56SG	FD46XG
Flash Point, ℃ ASTM D92	245	215
Auto-ignition,℃ ASTM D2155	385	382

Flash Point



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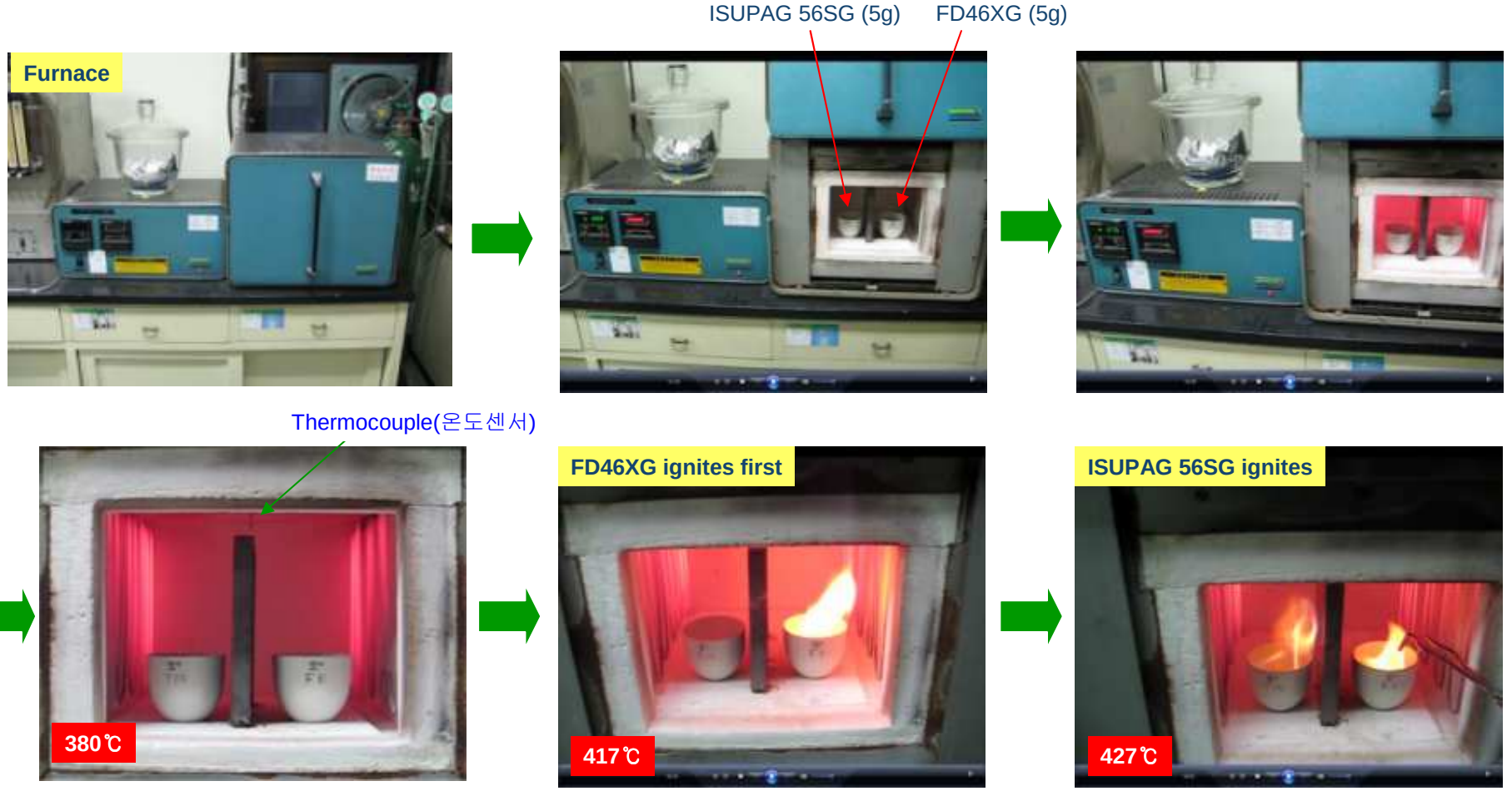
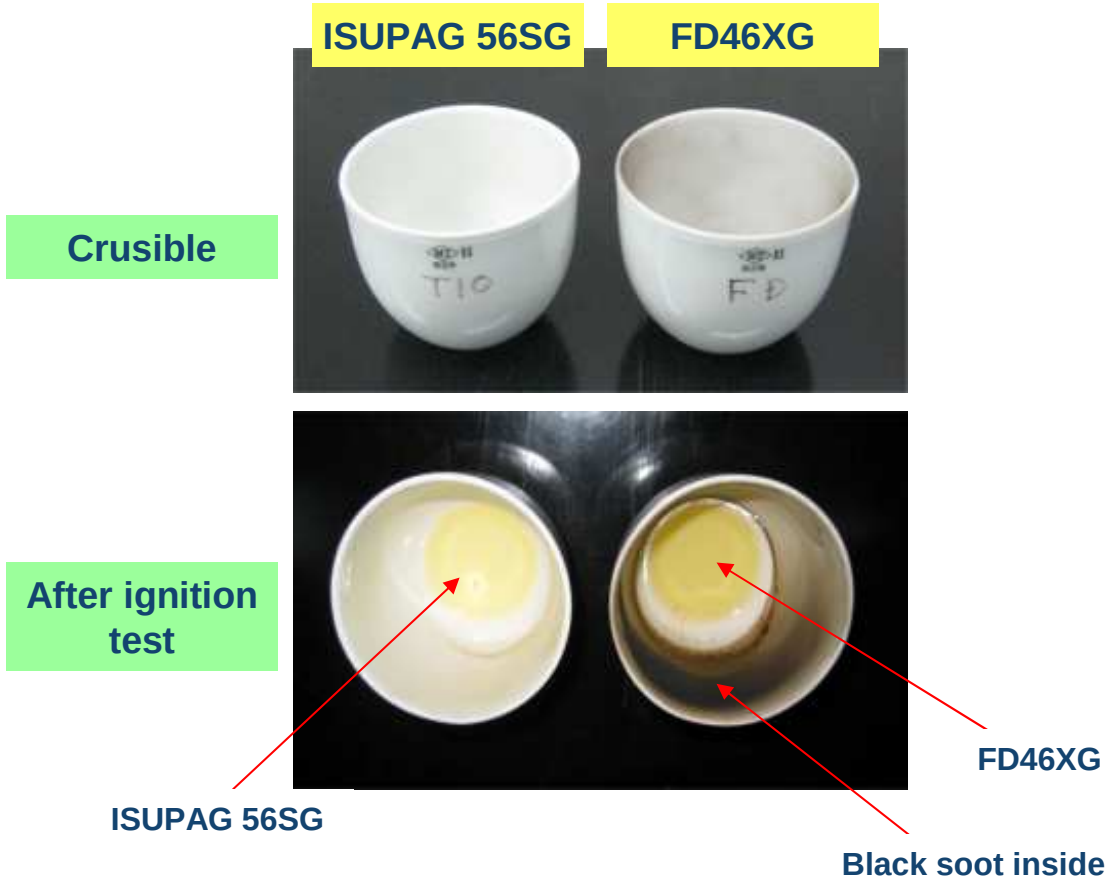
2. Flammability Comparison for PAG Oils in Furnace

5g of two different PAG oil was placed in a furnace. Temperature was increased until the oils ignite.

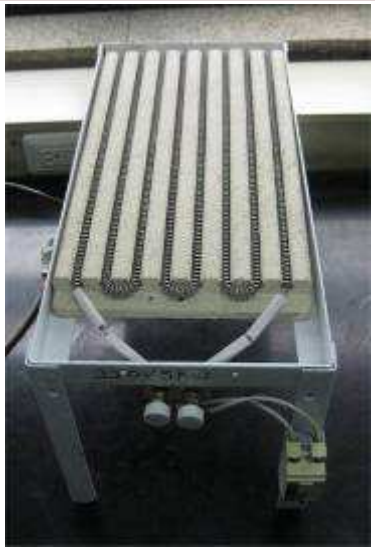


*** ISUPAG 56SG ignites at 427ºC, 10ºC higher than FD46XG.**

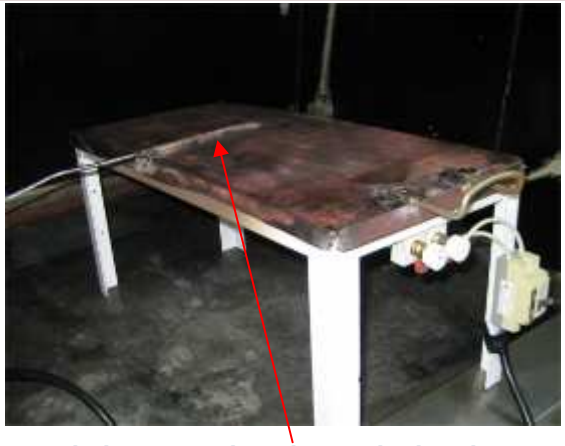
2. Flammability Comparison for PAG Oils in Furnace



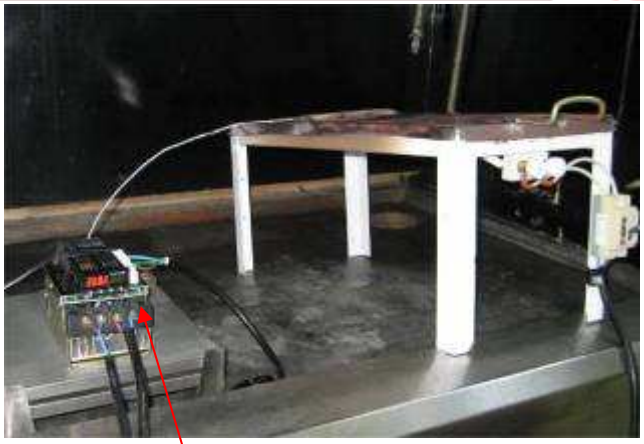
3. Flammability Evaluation for Oil&R134a Mixture on Hot Surface



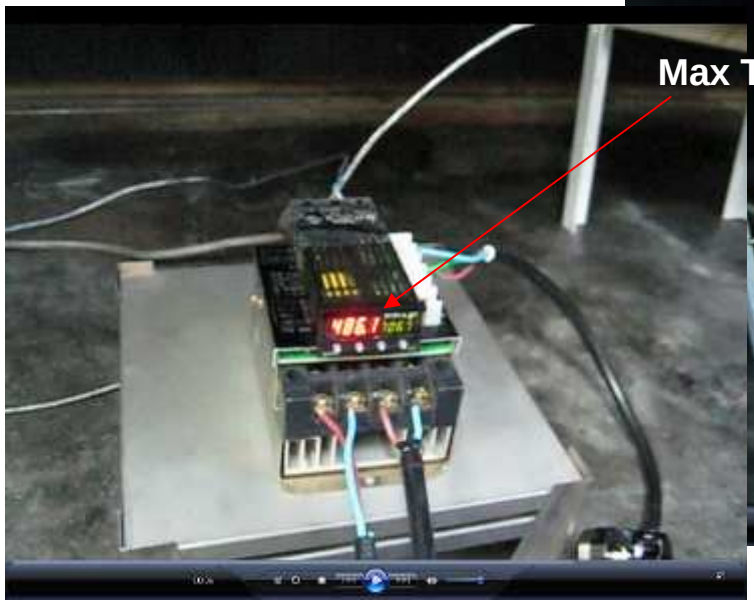
5KW, 220v
Heating Element

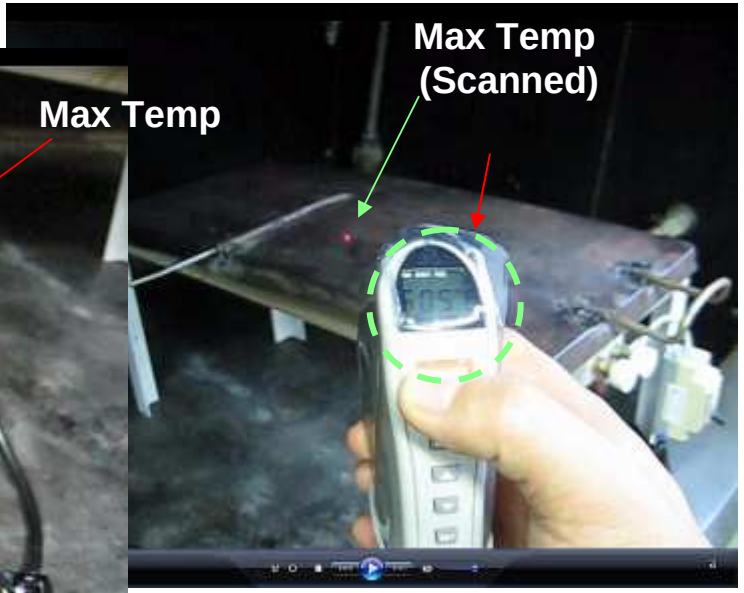


Metal plate was placed over the heating element, T/C was attached to the metal plate



Temperature Control Device





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3. Flammability Evaluation for Oil&R134a Mixture on Hot Surface

FD46XG+ R134a flammability test on 505℃ hot surface

Autoclave used to discharge refrigerant and oil mixture.

PAG oil ignites

ISUPAG ignites, but does not propagate or spread to refigerant
Flame lasted < 1 sec

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3. Flammability Evaluation for Oil&R134a Mixture on Hot Surface

ISUPAG 56SG + R134a flammability test onh 505℃ hot surface

PAG oil ignites

Autoclave used to discharge refrigerant and oil mixture.

PAG ignites, but does not propagate or spread to refigerant
Flame lasted < 1 sec

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3. Flammability Evaluation for Oil&HFO1234yf Mixture on Hot Surface

FD46XG+ HFO1234yf flammability test on 505℃ hot surface

Autoclave used to discharge refrigerant and oil mixture.

PAG oil ignites

PAG ignites, but does not propagate or spread to refigerant
Flame lasted ~ 1 sec

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3. Flammability Evaluation for Oil&HFO1234yf Mixture on Hot Surface

ISUPAG 56SG + HFO1234yf flammability test on 505℃ hot surface

Autoclave used to discharge refrigerant and oil mixture.

ISUPAG ignites, but does not propagate or spread to refrigerant
Flame lasted < 1 sec

ISUPAG ignites, but does not propagate or spread to refrigerant
Flame lasted ~ 1 sec

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3. Flammability Evaluation for Oil&CO2 Mixture on Hot Surface

CO2 with various oil flammability test on 505℃ hot surface

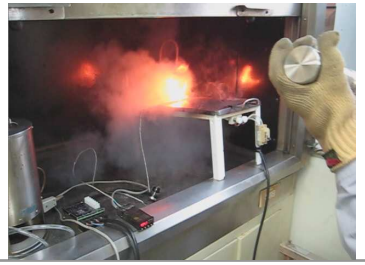
FD46XG:

ISUPAG56SG

Reniso ACC4

4. Conclusion

Flammability Result

Oil \ Refrigerant	R134a	HFO1234yf	CO2
ISUPAG AG 56 SG			
FD46XG			

For both R134a and HFO1234yf, mixture of oil and refrigerant ignited when discharged onto the hot surface. However, there was no case in which the flame has propagated or spread to refrigerant.